

1 What is claimed is:

2 1. A method of vending vendible products from a vending machine
3 comprising:

4 a) initiating a first vend cycle;

5 b) monitoring whether a product is sensed during a first
6 vend cycle;

7 c) if not sensed during the period after the first vend
8 cycle, initiating a second vend cycle;

9 d) monitoring if a product is sensed during the second vend
10 cycle.

11 2. The method of claim 1 further comprising assuming a
12 successful vend if a product is sensed during the first vend cycle.

13 3. The method of claim 2 further comprising resetting for next
14 vend after an assumption of a successful vend.

15 4. The method of claim 3 wherein the resetting includes
16 returning to a home position.

17 5. The method of claim 1 further comprising pausing for a
18 predetermined time after the first vend cycle, if no product is
19 sensed, and monitoring for a product during at least a portion of
20 the pause.

21 6. The method of claim 5 further comprising if a product is
22 sensed during pause, resetting for next vend.

1 7. The method of claim 1 further comprising if no product is
2 sensed during the monitoring of the second vend cycle, initiating
3 an end procedure.

4 8. The method of claim 7 wherein the end procedure comprises one
5 or more of the following: (a) alerting the customer of an
6 unsuccessful vend, (b) providing the customer credit for another
7 selection, (c) disabling any further vend cycles, (d) flagging the
8 event for remedial action.

9 9. The method of claim 7 wherein the end procedure comprises
10 resetting to allow at least one additional vend cycle.

11 10. The method of claim 9 wherein a predetermined of additional
12 vend cycles are not successful, instigating an alternative end
13 procedure.

14 11. The method of claim 10 wherein the alternative end procedure
15 one or more of the following: (a) alerting the customer of an
16 unsuccessful vend, (b) providing the customer credit for another
17 selection, (c) disabling any further vend cycles, (d) flagging the
18 event for remedial action.

19 12. The method of claim 1 further comprising checking the
20 monitoring prior to the first vend cycle.

21 13. The method of claim 12 wherein the check is for a
22 predetermined time.

1 14. The method of claim 13 further comprising if the checking of
2 the monitoring indicates error or malfunction defaulting vending
3 cycle operation to a method not dependent on monitoring of product.

4 15. The method of claim 1 wherein the vending machine comprises a
5 controller, an electro-mechanical dispensing unit including a motor
6 for effecting vend cycles, a motor position sensor for indicating
7 home position of the motor and a spiral product mover operatively
8 connected to the motor, and an optical product sensor positioned
9 along a path between the dispensing unit and a customer accessible
10 location for monitoring and sensing product dispensed by the
11 dispensing unit, the motor, motor position sensor and optical
12 product sensor in operative communication with the controller.

13 16. The method of claim 15 wherein on each reset of the
14 dispensing unit, performing a check of operation of the optical
15 sensor, and if operation is deemed compromised, defaulting to
16 operating vend cycles based on sensing home position of the motor
17 from the home position sensor.

18 17. The method of claim 16 further comprising instigating an end
19 procedure if no return to home position is sensed from the home
20 position sensor.

21 18. The method of claim 17 wherein the end procedure is one or
22 more of the following: (a) alerting the customer of an
23 unsuccessful vend, (b) providing the customer credit for another

1 selection, (c) disabling any further vend cycles, (d) flagging the
2 event for remedial action.

3 19. The method of claim 16 wherein during a first vend cycle if a
4 product is sensed by the optical sensor, communicating the same to
5 the controller which assumes a successful vend, and continue
6 operation of the motor back to home, and reset for next vend.

7 20. The method of claim 19 further comprising pausing the motor
8 in home position if no product is sensed by the optical sensor
9 during the first vend cycle, and monitor for a product.

10 21. The method of claim 20 further comprising during the pause,
11 if a product is sensed by the optical sensor, communicating the
12 same to the controller which assumes a successful vend and reset
13 for next vend.

14 22. The method of claim 21 further comprising if no product is
15 sensed during pause, initiating a second vend cycle by beginning
16 operation of the motor from home position.

17 23. The method of claim 22 further comprising if a product is
18 sensed by the optical sensor during the second vend cycle,
19 communicating the same to the controller which assumes a successful
20 vend, and stop operation of the motor, and reset for next vend.

21 24. The method of claim 22 further comprising if no product is
22 sensed by the optical sensor during the second vend cycle,
23 operating the motor back to home position.

1 25. The method of claim 24 further comprising pausing the motor
2 after the motor reaches home position and monitor for a product.

3 26. The method of claim 24 further comprising during the pause,
4 if a product is sensed by the optical sensor, communicating the
5 same to the controller which assumes a successful vend and reset
6 for next vend.

7 27. The method of claim 26 further comprising instigating an end
8 procedure if no product is sensed during pause after the second
9 vend cycle.

10 28. The method of claim 27 wherein the end procedure is one or
11 more of the following: (a) alerting the customer of an
12 unsuccessful vend, (b) providing the customer credit for another
13 selection, (c) disabling any further vend cycles, (d) flagging the
14 event for remedial action.

15 29. The method of claim 27 wherein the end procedure is a
16 resetting for next vend cycle.

17 30. The method of claim 1 further comprising keeping track of
18 number of second vend cycles initiated.

19 31. The method of claim 1 further comprising keeping track of
20 number of second vend cycles relative to number of first vend
21 cycles.

22 32. An apparatus for vending vendible products comprising:

23 a) a controller;

- b) an electro-mechanical dispensing unit comprising a motor in communication with the controller and a helical product holder rotatably connected to the motor;
- c) a motor home position sensor operatively communicated with the motor and the controller;
- d) a product sensor in communication with the controller and located between the dispensing unit and a customer access location in the vending machine;
- e) the controller including programming comprising:
 - 1) upon authorized customer selection, instructing a first vend cycle, initiating operation of the motor while monitoring product dispensation with the product sensor;
 - 2) if the product sensor indicates a product dispensation during the first vend cycle, operate the motor to home;
 - 3) if the product sensor does not indicate a product dispensation during the first vend cycle before the motor reaches home, initiate a second vend cycle while monitoring for product.

33. The apparatus of claim 32 wherein the motor home position sensor comprises an internal switch in the motor.

1 34. The apparatus of claim 32 wherein the product sensor
2 comprises an optical sensor.

3 35. The apparatus of claim 34 wherein the optical sensor
4 comprises a photo-optical detector.

5 36. The apparatus of claim 35 wherein the photo-optical detector
6 comprises an infrared emitter and receiver.

7 37. A method for vending vendible products from a vending
8 machine, wherein the vending machine comprises a controller, an
9 electro-mechanical dispensing unit including a motor for effecting
10 vend cycles, a motor position sensor for indicating home position
11 of the motor and a spiral product mover operatively connected to
12 the motor, and an optical product sensor positioned along a path
13 between the dispensing unit and a customer accessible location for
14 monitoring and sensing product dispensed by the dispensing unit,
15 the motor, motor position sensor and optical product sensor in
16 operative communication with the controller, comprising:

- 17 a) Pre-testing operability of the optical sensor;
18 b) Default to use of motor home position sensor for indication
19 of completion of a vend cycle if the optical sensor fails
20 the pretest;
21 c) If the optical detector passes the pretest

- 1) Initiate a first vend cycle by initiating rotation of the motor while monitoring for product with the optical sensor;
- 2) If a product is sensed, reset to step a) and operate motor back to home;
- 3) If a product is not sensed during the first vend cycle, operate motor to home, pause and monitor for product with the optical sensor;
- 4) If a product is sensed during pause, reset to step a);
- 5) If a product is not sensed during pause, initiate a second vend cycle by initiating rotation of the motor and monitor for product with the optical sensor;
- 6) If a product is sensed during the second vend cycle, stop the motor where it is at in rotational position and reset to step a);
- 7) If a product is not sensed during the second vend cycle, operate the motor to home.

38. The method of claim 37 further comprising optical sensing by photo-optical technique.

39. The method of claim 38 further comprising sending a signal to a controller if a product is sensed.

40. The method of claim 37 further comprising defaulting to a stop on home position vend protocol.

- 1 41. The method of claim 37 further comprising sending a signal
2 indicating unsuccessful vend after the first cycle.
- 3 42. The method of claim 37 wherein the pause after the first vend
4 cycle is a predetermined period of time.
- 5 43. The method of claim 37 further comprising a pause period after
6 an unsuccessful second vend cycle.
- 7 44. The method of claim 37 further comprising immediately stopping
8 the second vend cycle upon sensing of a product.
- 9 45. The method of claim 44 further comprising alerting a customer
10 if a product is not sensed after the second vend cycle.
- 11 46. The method of claim 45 further comprising allowing at least
12 one additional vend cycle if a product is not sensed after the
13 second vend cycle.
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